CLAIMS

1. A cryosurgical probe system, comprising:
    a) a fluid supply line connectable at an inlet section to a source of cryogenic fluid;
    b) a fluid connector assembly securely connected to an outlet section of said fluid supply line for receiving fluid from said outlet section of said fluid supply line;
    c) a detachable cryosurgical probe detachably connectable to said fluid connector assembly, said cryosurgical probe for receiving fluid from said fluid connector assembly and manipulating said fluid to provide suitable temperatures for cryosurgical treatment.

2. The cryosurgical probe system of Claim 1, wherein:
    a) said detachable cryosurgical probe includes a probe return fluid flow passageway;
    b) said fluid connector assembly includes a connector assembly return fluid flow passageway in fluid communication with said probe return fluid flow passageway; and,
    c) said fluid supply line includes a supply line return fluid flow passageway in fluid communication with said connector assembly return fluid flow passageway.

3. The cryosurgical probe system of Claim 1, wherein said detachable cryosurgical probe, comprises:
    a) a fluid delivery assembly having a proximal end section;
    b) a return manifold assembly positioned over a portion of said fluid delivery assembly; said return manifold assembly providing a desired insulative air gap;
    c) an outer sheath securely positioned over said return manifold assembly; and,
    d) a hub securely positioned over said outer sheath and said return manifold assembly, said hub for detachable connection to a fluid connector assembly of a detachable cryosurgical system,

    wherein during operation fluid is delivered through said fluid delivery assembly, through a Joule-Thomson (J-T) port defined at a distal end of said fluid delivery assembly and is returned through said return manifold assembly and delivered out of said cryosurgical probe, an insulative air gap being provided between said outer sheath and said return manifold at a control region of said outer sheath proximal to a distally located treatment region of said outer sheath.

4. The cryosurgical probe system of Claim 3, wherein said fluid delivery assembly comprises:
    a) a high pressure stem for receiving high pressure fluid from the fluid connector assembly;
    b) an extension tube secured, at a first end, to said high pressure stem, said extension tube being in fluid communication with said high pressure stem; and,
    c) an orifice tube secured to a second end of said extension tube, said orifice tube being in fluid communication with said extension tube, said orifice tube having said J-T port at a distal end thereof.

5. The cryosurgical probe system of Claim 4, wherein said return manifold assembly comprises:
    a) a low pressure stem positioned about an outer surface of said high pressure stem, said low pressure stem being securely connected to said high pressure stem; and,
    b) a vacuum tube secured at a first end to said low pressure stem, said vacuum tube having said desired insulative air gap formed therein, a portion of the return fluid flow passageway being provided between a space formed between an inner surface of said vacuum tube and an outer surface of said extension tube,

    another portion of the return fluid flow passageway being provided between a space formed between an inner surface of said low pressure stem and an outer surface of said extension tube, said low pressure stem further including at least one opening to deliver return fluid to said fluid connector assembly.

6. The cryosurgical probe system of Claim 5, wherein said outer sheath, comprises:
    a cylindrical tube having a closed distal end.

7. The cryosurgical probe system of Claim 6, wherein said hub, comprises:
    a) a cylindrical portion; and,
    b) a tapered extension extending from said cylindrical portion, said tapered extension having a radial extending portion, wherein said cylindrical portion is securely attached to said outer sheath and said tapered extension is securely attached to said low pressure stem.

8. The cryosurgical probe system of Claim 7, wherein said sheath further includes a cylindrical collector having external threads that cooperate with said cylindrical tube to guide the return fluid from the J-T port to said vacuum tube.

9. The cryosurgical probe system of Claim 1, having a total length in a range of 4-20 inches.

10. The cryosurgical probe system of Claim 1, having a total length in a range of 5-15 inches.

11. The cryosurgical probe system of Claim 1, wherein said fluid connector assembly comprises:
    a) a substantially cylindrical connector housing having a radially extending boss securely attached to said outlet section of said fluid supply line, said connector housing having a fluid inlet conduit for receiving high pressure fluid from said fluid supply line and a fluid outlet conduit for transferring return fluid from said cryosurgical probe to said fluid supply line;
    b) a lock housing securely positioned within an axial opening of said connector housing, said lock housing having a cylindrical portion and a locking portion;
    c) a spacing element for axially positioning said lock housing relative to said connector housing and radially positioning said detachable cryosurgical probe relative to said lock housing;
    d) a high pressure seal positioned relative to said cryosurgical probe, said connector housing and said spacing element to contain the high pressure fluid within the connector housing and enable the high pressure fluid to be delivered to said cryosurgical probe;
    e) a low pressure seal positioned relative to said cryosurgical probe, said spacing element, and said lock housing to prevent return fluid leakage; and,
    f) a locking spring positioned in said locking portion of said lock housing to provide detachable engagement of a cryosurgical probe positioned therein.

12. The cryosurgical probe system of Claim 11, wherein said connector housing and said radially extending boss are at substantially 90 degrees relative to each other.

13. The cryosurgical probe system of Claim 11, wherein said connector housing and said radially extending boss are positioned at an angle from between about 0 degrees and 180 degrees relative to each other.

14. The cryosurgical probe system of Claim 11, wherein said connector housing and said radially extending boss are positioned at an angle from between about 80 degrees and 140 degrees relative to each other.

15. The cryosurgical probe system of Claim 11, wherein said fluid supply line comprises a cryostat positioned therein for delivering fluid from the fluid supply line to said fluid connector assembly.

16. The cryosurgical probe system of Claim 1, wherein said outlet section of said fluid supply line and a longitudinal axis of said cryosurgical probe are at substantially 90 degrees relative to each other.

17. The cryosurgical probe system of Claim 1, wherein said outlet section of said fluid supply line and a longitudinal axis of said cryosurgical probe are positioned at an angle from between about 0 degrees and 180 degrees relative to each other.

18. The cryosurgical probe system of Claim 1, wherein said outlet section of said fluid supply line and a longitudinal axis of said cryosurgical probe are positioned at an angle from between about 80 degrees and 140 degrees relative to each other.

19. The cryosurgical probe system of Claim 1, wherein said cryogenic fluid comprises argon.

20. The cryosurgical probe system of Claim 1, wherein said fluid supply line is connectable to a fluid source of a type that warms while undergoing Joule-Thomson expansion.

21. The cryosurgical probe system of Claim 1, further comprising an ultrasound system for guidance.

22. The cryosurgical probe system of Claim 1, further comprising an MRI system for guidance.

23. The cryosurgical probe system of Claim 1, wherein said detachable cryosurgical probe further includes means for warming.

24. The cryosurgical probe system of Claim 1, wherein said detachable cryosurgical probe further includes means for warming, said means for warming comprising electrical heating means.

25. The cryosurgical probe system of Claim 1, wherein said detachable cryosurgical probe further includes means for warming, said means for warming comprising RF heating means.

26. The cryosurgical probe system of Claim 1, wherein said fluid connector assembly comprises a thermocouple secured therein for providing temperature data.

27. The cryosurgical probe system of Claim 1, wherein said detachable cryosurgical probe comprises an outer sheath having an echogenic coating.

28. The cryosurgical probe system of Claim 1, wherein said detachable cryosurgical probe comprises an outer sheath having an echogenic coating.

29. The cryosurgical probe system of Claim 1, wherein said detachable cryosurgical probe comprises a malleable segment.

30. The cryosurgical probe system of Claim 1, wherein said detachable cryosurgical probe comprises a bellows portion.

31. A cryosurgical probe system, comprising:
    a) a fluid supply line;
    b) a fluid connector assembly securely connected to said fluid supply line for receiving fluid from said fluid supply line;
    c) a detachable cryosurgical probe detachably connectable to said fluid connector assembly, said cryosurgical probe for receiving fluid from said fluid connector assembly and manipulating said fluid to provide suitable temperatures for treatment.

32. A detachable cryosurgical probe for connection to a fluid connector assembly of a detachable cryosurgical system, comprising:
    a) a fluid delivery assembly having a proximal end section;
    b) a return manifold assembly positioned over a portion of said fluid delivery assembly; said return manifold assembly providing a desired insulative air gap;
    c) an outer sheath securely positioned over said return manifold assembly; and,
    d) a hub securely positioned over said outer sheath and said return manifold assembly, said hub for detachable connection to a fluid connector assembly of a detachable cryosurgical system,

    wherein during operation fluid is delivered through said fluid delivery assembly, through a Joule-Thomson (J-T) port defined at a distal end of said fluid delivery assembly and is returned through said return manifold assembly and delivered out of said cryosurgical probe, an insulative air gap being provided between said outer sheath and said return

manifold at a control region of said outer sheath proximal to a distally located treatment region of said outer sheath.

33. The detachable cryosurgical probe of Claim 32, wherein said fluid delivery assembly comprises:
    a) a high pressure stem for receiving high pressure fluid from the fluid connector assembly;
    b) an extension tube secured, at a first end, to said high pressure stem, said extension tube being in fluid communication with said high pressure stem; and,
    c) an orifice tube secured to a second end of said extension tube, said orifice tube being in fluid communication with said extension tube, said orifice tube having said J-T port at a distal end thereof.

34. The detachable cryosurgical probe of Claim 33, wherein said return manifold assembly comprises:
    a) a low pressure stem positioned about an outer surface of said high pressure stem, said low pressure stem being securely connected to said high pressure stem; and,
    b) a vacuum tube secured at a first end to said low pressure stem, said vacuum tube having said desired insulative air gap formed therein, a portion of the return fluid flow passageway being provided between a space formed between an inner surface of said vacuum tube and an outer surface of said extension tube,

    another portion of the return fluid flow passageway being provided between a space formed between an inner surface of said low pressure stem and an outer surface of said extension tube, said low pressure stem further including at least one opening to deliver rteturn fluid to said fluid connector assembly.

35. The detachable cryosurgical probe of Claim 32, wherein said outer sheath, comprises:
    a cylindrical tube having a closed distal end.

36. The detachable cryosurgical probe of Claim 32, wherein said hub, comprises:
    a) a cylindrical portion; and,
    b) a tapered extension extending from said cylindrical portion, said tapered extension having a radial extending portion, wherein said cylindrical portion is securely attached to said outer sheath and said tapered is securely attached to said low pressure stem.

37. The detachable cryosurgical probe of Claim 32, wherein said sheath further includes a cylindrical collector having external threads that cooperate with said cylindrical tube to guide the return fluid from the J-T port to said vacuum tube.

38. The detachable cryosurgical probe of Claim 32, having a total length in a range of 4-20 inches.

39. The detachable cryosurgical probe of Claim 32, having a total length in a range of 5-15 inches.

40. A cryosurgical system for use with computerized tomography (CT) applications, comprising:
    a) a hose for supplying a cooling fluid;
    b) a fluid connector assembly securely connected to a distal end of said hose, said fluid connector assembly having a central axis; and,
    c) a detachable cryosurgical probe detachably connectable to said fluid connector assembly,

    wherein, said central axis of said fluid connector assembly is angled relative to said distal end of said hose to provide access to said cryosurgical system within a CT scanner.

41. A method for providing cryosurgical treatment of a patient, comprising the steps of:
    a) introducing at least one detachable cryosurgical probe into a treatment zone of a patient;
    b) introducing the patient relative to an imaging device to provide imaging of said treatment zone during cryosurgical treatment, wherein said detachable cryosurgical probe is a component of a cryosurgical probe system, said cryosurgical probe system, further comprising:
        i. a fluid supply line connectable at an inlet section to a source of cryogenic fluid;
        ii. a fluid connector assembly securely connected to an outlet section of said fluid supply line for receiving fluid from said outlet section of said fluid supply line, said detachable cryosurgical probe being detachably connectable to said fluid connector assembly, said cryosurgical probe for receiving fluid from said fluid connector assembly and manipulating said fluid to provide suitable temperatures for cryosurgical treatment.

42. A method for providing cryosurgical treatment of a patient, comprising the steps of:
    a) introducing at least one detachable cryosurgical probe into a treatment zone of a patient, said at least one detachable cryosurgical probe being in a detached mode;
    b) introducing the patient relative to an imaging device to provide an initial indication that the probes are properly inserted in said treatment zone;
    c) attaching said at least one detachable cryosurgical probe to a fluid connector assembly connected to a fluid supply line; and,
    d) introducing the patient relative to an imaging device to provide imaging of said treatment zone during cryosurgical treatment.